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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/840,095	05/06/2004	Chao-Lung Chen	N1085-00288	7304

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EXAMINER

NGUYEN, THANH T

ART UNIT	PAPER NUMBER
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2813

DATE MAILED: 10/17/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/840,095

Applicant(s)

CHEN ET AL.

Examiner

Thanh T. Nguyen

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 02 August 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-23 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-23 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Response to Arguments***

Applicant's arguments with respect to claims 1-23 have been considered but are moot in view of the new ground(s) of rejection.

### ***Specification***

The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-2, 12-14, 17-18 are rejected under 35 U.S.C. 102(b) as being anticipated by Zheng et al. (U.S. Patent No.6,746,591).

immersing the wafer (see claim 24) in an electrolytic solution containing metal ions (see figures 3, see the title and col. 2, lines 26-41); and

biasing the wafer negatively with respect to the electrolytic solution so as to create a current flow between the electrolytic solution and the wafer and thereby electroplate a metal layer (see col. 9, lines 42-62, noted that plating wafer must always put on negative side so that positive metal ions can be attracted to the wafer and therefore deposit on the wafer) on a surface of the wafer in a continuous electroplating operation that continuously deposits the metal layer on the surface (see figure 5) by first biasing the wafer to produce a first current density (501), then secondly biasing the wafer to produce a second current density (502), the second current density being greater than zero and less than the first current density and the first biasing being the initial step in the continuous electroplating operation (see figure 5).

regarding to claim 2. wherein the biasing the wafer further includes, after the secondly biasing, thirdly biasing the wafer (501, the second peak) to produce a third current density, the third current density being greater than the second current density (see figure 5, the first current is the first 501, the second current is 502, the third current is the second 501, see figure 5).

regarding to claim 6. wherein the first biasing, the secondly biasing, and the thirdly biasing are carried out in-situ (see figure 5, col. 8, lines 60-67, col. 9, lines 1-40). It is inherent that since there is no mention of transferring from one chamber to another, hence first, second and third bias are carried in-situ.

regarding to claim 12. wherein the metal ions are copper ions and the metal layer comprises copper (see figures 3, see the title and col. 2, lines 26-41).

regarding to claim 13. wherein the surface includes an upper portion and an opening extending downwardly therefrom and the biasing the wafer negatively produces the metal layer

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substantially completely filling the opening copper (see col. 9, lines 15-35 figures 3, see the title and col. 2, lines 26-41).

Regarding to claim 14, the opening is a via that includes a width no greater than 0.25 microns (see col. 9, lines 26-30).

Regarding to claim 17, depositing a seed layer on the surface prior to the biasing (see title, and col. 2, lines 15-21).

Regarding to claim 18, depositing a see layer on the wafer (see title, and col. 2, lines 15-21)

Electroplating the metal layer (copper, see title, and col. 2, lines 15-21) on the wafer, by first biasing the wafer to produce a first current density (501), then secondly biasing the wafer to produce a second current density (502), the second current density being greater than zero and less than the first current density and the first biasing being the initial step in the continuous electroplating operation (see figure 5), third current density (501, the second 501 of figure 5) being greater than the second density (502).

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 3-11, 15-16, 19-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zheng et al. (U.S. Patent No.6,746,591) as applied to claims 1-2, 12-14, 17-18 above in view of a person of ordinary skill in the art.

Zheng et al. teach electroplating the metal in the via with the width of 0.25 microns at different current densities in the plasma chamber.

However, the reference does not teach the third density is greater than the first density, the fourth density is greater than the third densities, the deposition rate, the specific densities, the time range, the flow rate of the electrolyte solution, the concentration of an accelerator.

Nevertheless, the specification contains no disclosure of the critical nature of the process/arrangement of the third density is greater than the first density, the fourth density is greater than the third densities, the deposition rate, the specific densities, the time range, the flow rate of the electrolyte solution, the concentration of an accelerator or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen limitations or upon another variable recited in a claim, the applicant must show that the chosen limitations are critical. In re Woodruff, 919 F.2d 1575, 1578 (Fed. Cir. 1990).

It would have been obvious to a person of ordinary skill in the requisite art at the time of the invention was made to optimize the third density is greater than the first density, the fourth density is greater than the third densities, the deposition rate, the specific densities, the time range, the flow rate of the electrolyte solution, the concentration of an accelerator, since it has been held that where the general conditions of a claim are disclosed in the prior art (i.e.- electroplating the copper, see figure 5), discovering the optimum or workable ranges involves only routine skill in the art. In re Aller, 105 USPQ 233 (CCPA 1955).

Therefore, it would have been obvious to a person of ordinary skill in the requisite art at the time of the invention was made would form a copper layer with the third density is greater than the first density, the fourth density is greater than the third densities, the specific deposition rate, densities, the time range, the flow rate of the electrolyte solution, and the concentration of an accelerator in process of Zheng et al. because choosing the various densities as well as specific range of densities, time, flow rate, concentration to form a desire copper film for interconnect.

### ***Conclusion***

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thanh Nguyen whose telephone number is (571) 272-1695, or by Email via address Thanh.Nguyen@uspto.gov. The examiner can normally be reached on Monday-Thursday from 6:00AM to 3:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, Jr., can be reached on (571) 272-1702. The fax phone number for this Group is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pairedirect.uspto.gov>. Should you have questions on access to thy Private PAIR system, contact the Electronic Business center (EBC) at 866-217-9197 (toll-free).



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